

Claims

What is claimed is:

1. An ultra-wideband antenna for operating in a frequency band having a lowest frequency f_l , comprising:
 - a ground plane;
 - a monopole antenna extending from the ground plane and having an effective length L of one quarter or one half wavelength, $\lambda_l/4$ or $\lambda_l/2$ respectively, at the lowest frequency f_l ; and
 - a dielectric resonator antenna (DRA) surrounding the monopole antenna for resonating at substantially between or at two and three times the lowest frequency f_l , the DRA having a height H less than $3/4L$, the DRA being disposed in such a manner as being above the ground plane and either contacting or spaced therefrom by a gap G , wherein $0 \leq G \leq 0.2H$.
2. The ultra-wideband antenna as defined in claim 1, wherein $H \leq L/2$; and wherein the monopole antenna extends beyond the dielectric antenna at an upper free end thereof, the upper end of the monopole antenna for generating a monopole radiation pattern.
3. The ultra-wideband antenna as defined in claim 2, wherein the relative permittivity ϵ_r of material comprising the DRA is equal to or greater than 8.
4. An ultra-wideband antenna for operating in a frequency band having a lowest frequency f_l and a bandwidth of B_{u-wa} , where B_{u-wa} is at least 4-times greater than $B_m + B_{DRA}$, comprising:
 - a ground plane;
 - a DRA having a bandwidth B_{DRA} ;
 - a monopole antenna having an bandwidth B_m surrounded by the DRA, for feeding the DRA and for radiating energy, the monopole antenna extending beyond the DRA at an upper end, wherein the monopole antenna extends vertically above the ground plane and has a effective length L of one quarter wavelength at the lowest frequency f_l , wherein the DRA is for resonating at a frequency f_{DRA} , wherein $2 f_l \leq f_{DRA} \leq 3 f_l$, wherein the dielectric resonator is of a height H , where $H \leq 1/2L$, and wherein the DRA is disposed in such a manner as being above the ground plane, and either contacting or spaced therefrom by a gap G , wherein $0 \leq G \leq 0.2H$.

5. An ultra-wideband antenna as defined in claim 4, wherein the DRA is for operating primarily in a $TM_{0N\delta}$ mode, where N is an integer greater than or equal to 1.
6. An ultra-wideband antenna as defined in claim 4, wherein the monopole antenna provides only a single feed to the DRA.
7. An ultra-wideband antenna as defined in claim 1, wherein the monopole antenna provides only a single feed to the DRA.
8. An ultra-wideband antenna as defined in claim 4, wherein the DRA is for operating primarily in a $TM_{01\delta}$ mode.
9. An ultra-wideband antenna for operating in a frequency band having a lowest frequency f_1 approximately 3.3 GHz, comprising a ground plane;
a monopole antenna extending from the ground plane and having an effective length L of approximately one quarter the wavelength at frequency f_1 ; and
a dielectric resonator antenna (DRA) surrounding the monopole antenna for resonating the $TM_{01\delta}$ mode at approximately three times the lowest frequency f_1 , the DRA having a height H between 0.3L and 0.5L, having a relative dielectric constant E_r of approximately 10, the DRA being disposed in such a manner as being above the ground plane and either contacting or spaced therefrom by a gap G, wherein G is less than or equal to 0.2H.